Report for 2003DE19B: Undergraduate Internship: Breeding Of Potential West Nile Virus Vectors In Stormwater Ponds And Constructed Wetlands

- Water Resources Research Institute Reports:
  - Bielawa, Megan, Jack Gingrich, 2004, Breeding Of Potential West Nile Virus Vectors In Stormwater Ponds And Constructed Wetlands, Delaware Water Resources Center, University of Delaware, Newark, Delaware, 19 pages.

Report Follows

Undergraduate Internship Project #1 of 10 for FY03

The project is co-sponsored by the ***UD College of Agriculture and Natural Resources (CANR)*** and the ***DWRC***.

"My DWRC project allows me to build on my existing interest in infectious diseases. Factors surrounding the spread of West Nile virus is a timely topic in our community, and I hope to investigate and better understand the role of agents found in new water impoundments at construction sites as predictors of the disease."
– Megan Bielawa, University of Delaware undergraduate senior, Biology major.

Abstract:

The objectives considered in this study included: 1) characterization of mosquito production in four different types of wetlands; 2) determine what constituted good and poor mosquito habitats; 3) determine what species of vectors may increase or decrease virus activity; and 4) determine during which parts of the season these mosquitoes breed most actively.

Sites were selected throughout Delaware and divided into retention, detention, constructed wetlands, and CREP ponds with a total of 53 sites selected. Collections were standardized throughout the season. Each site was sampled using a 350-ml dipper at 5 sub-sites per site, which were marked with plastic marking flags. Mosquitoes found at each site were returned to the lab for species identification. Water quality measurements including water temperature, pH, conductivity, and total dissolved solvents were taken at each site along with water appearance, pollution, dominant vegetation, depth, amount of shade, and predation levels. Large constructed wetlands were divided into zones and then sub-sites and sampled as described for the smaller sites.

Data were collected at bi-weekly intervals throughout the season, returned to the lab, and entered into a Microsoft Access database. Mosquitoes brought back to the lab were maintained at a 26.5^{o}C environment until species identification. Once the data from all of the sites was entered into the database, analysis and comparisons of the data were made.

Distribution of mosquitoes peaked in abundance twice during the season, once in June and again in August. These peaks in abundance occurred mostly in retention and detention ponds, and to a lesser degree in CREP ponds, which only peaked once in late June. Retention and CREP ponds were further classified into shallow and steep-sided. In both cases, shallow ponds produce more mosquitoes than steep sided ponds. Heavily shaded ponds were associated with a higher number of mosquitoes than partially or un-shaded ponds. According to the predator index, an increase in predators lagged an increase in mosquitoes by approximately two weeks. In detention ponds, *Aedes vexans*, an important WNV vector, was the principle species seen. In retention ponds, *Culex salinarius* and *Culex territans* were more abundant, both being important WNV vectors. Cattails and sedges were associated more with *Ae. vexans* and *Oc. sollicitans* while *Cx.* species closely associated with cattails, phragmites, and willows. Mosquitoes were more abundant in turbid water than in clear, colored, or polluted water. Larval mosquito levels were also low at very acidic or basic pH levels and peaked in abundance at levels of pH=6 and pH=9, with the higher peak at six.

Mosquito production was highest in retention and detention ponds. *Culex* species, particularly *Cx. salinarius* and *Cx. territans*, and *Ae vexans* were important WNV vectors that may increase virus

activity where these species were most prominent. Retention ponds were good habitats for *Cx.* species, while detention ponds, due to continual drying out and flooding, made good habitats for *Ae. vexans*. Breeding of these species was most active in mid-June and late August.